

Quiz 3
Business Mathematics

14th February 2006

Time: 1 hour (10–11pm)

Choose only one problem[10], either

1. Solve

$$\begin{aligned}y + 3z &= 9 \\2x + 2y - z &= 8 \\-x + 5z &= 8\end{aligned}$$

by Gaussian elimination.

Solution. Write an augmented matrix,

$$\left[\begin{array}{cccc} 0 & 1 & 3 & 9 \\ 2 & 2 & -1 & 8 \\ -1 & 0 & 5 & 8 \end{array} \right]$$

$(I) \leftrightarrow (III), (0 \ 1 \ 3 \ 9) \leftrightarrow (-1 \ 0 \ 5 \ 8);$

$$\left[\begin{array}{cccc} -1 & 0 & 5 & 8 \\ 2 & 2 & -1 & 8 \\ 0 & 1 & 3 & 9 \end{array} \right]$$

$-1(I), -1(-1 \ 0 \ 5 \ 8); (II) - 2(I), (2 \ 2 \ -1 \ 8) - 2(1 \ 0 \ -5 \ -8);$

$$\left[\begin{array}{cccc} 1 & 0 & -5 & -8 \\ 0 & 2 & 9 & 24 \\ 0 & 1 & 3 & 9 \end{array} \right]$$

$II \leftrightarrow III, (0 \ 2 \ 9 \ 24) \leftrightarrow (0 \ 1 \ 3 \ 9); (III) - 2(II), (2 \ 9 \ 24) - 2(1 \ 3 \ 9);$

$$\left[\begin{array}{cccc} 1 & 0 & -5 & -8 \\ 0 & 1 & 3 & 9 \\ 0 & 0 & 3 & 6 \end{array} \right]$$

Therefore, directly we have $z = 2, y = 9 - 3(2) = 3$ and $x = -8 + 5(2) = 2$.

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or

2. Solve

$$\begin{aligned}2x + y - 2z &= 10 \\3x + 2y + 2z &= 1 \\5x + 4y + 3z &= 4\end{aligned}$$

by any method.

Solution. Form an augmented matrix,

$$\left[\begin{array}{cccc} 2 & 1 & -2 & 10 \\ 3 & 2 & 2 & 1 \\ 5 & 4 & 3 & 4 \end{array} \right]$$

$\frac{1}{2}(I), (1 \ \frac{1}{2} \ -1 \ 5); (II) - 3(I), (3 \ 2 \ 2 \ 1) - 3(1 \ \frac{1}{2} \ -1 \ 5); (III) - 5(I), (5 \ 4 \ 3 \ 4) -$
 $5(1 \ \frac{1}{2} \ -1 \ 5);$

$$\left[\begin{array}{cccc} 1 & \frac{1}{2} & -1 & 5 \\ 0 & \frac{1}{2} & 5 & -14 \\ 0 & \frac{3}{2} & 8 & -21 \end{array} \right]$$

$2(II), (1 \ 10 \ -28); (III) - \frac{3}{2}(II), (\frac{3}{2} \ 8 \ -21) - \frac{3}{2}(1 \ 10 \ -28);$

$$\left[\begin{array}{cccc} 1 & \frac{1}{2} & -1 & 5 \\ 0 & 1 & 10 & -28 \\ 0 & 0 & -7 & 21 \end{array} \right]$$

Directly, $z = -\frac{21}{-7} = 3, y = -28 - 10(-3) = 2$ and $x = 5 - \frac{1}{2}(2) + (-3) = 1$.

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